

REMARKS

Claims 3-45 are pending in the application. Claims 3-10, 14-18, 21-25, and 27-45 remain after amendment. Claims 11, 12, 13, 19, 20 and 26 have been canceled without prejudice. Claims 40-454 are new. No new matter is introduced with the amendments to the claims or with the addition of the new claims.

It is believed that the remarks laid out herein below attend to all of Examiner's rejections of the claims.

3-4. CLAIM REJECTIONS – 35 U.S.C. §103(a)

Claims 3 – 39 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Number 6,400,535 to Shimazawa et al. (hereinafter "Shimazawa") in view of U.S. Patent Number 6,248,418 to Lambeth et al. (hereinafter "Lambeth"). Respectfully we disagree.

A brief summary of the instant application versus Shimazawa and Lambeth may be helpful before specific discussion of the claims. Applicant teaches a multi layered pinned reference layer **308** that is established with a first layer **314** and a second layer **316**. Of great significance is the fact that the first layer **314** and second layer **216** cooperatively interact to self seed and provide <111> crystal texture within the reference layer **308**. This <111> crystal texture is obtained without requiring the first **314** and second layer **316** to be grown upon a seed layer. This <111> crystal texture is also obtained without requiring the first **314** and second layer **316** to be treated with ion energy.

As the <111> crystal texture is highly advantageous in establishing the pinning field within the reference layer, the ability to omit a seed layer or the use of ion energy and rely on the cooperative interaction of layers **314** and **316** to provide the <111> crystal texture is highly advantageous.

This advantageous self-seeded <111> crystal texture pinned reference layer **308** can be used in top or bottom pinned spin device. In addition the self-seeded <111> crystal texture pinned reference layer **308** can be employed in both tunneling magneto-resistance memory cells (TMR), giant magneto-resistance memory cells (GMR), or colossal magneto-resistance memory cells (CMR). This applicability is advantageous for while all of these spin valve devices have an intermediate layer separating the data layer from the reference layer, in the TMR cells the intermediate layer **308** is a thin barrier of dielectric material, whereas in GMR the intermediate **308** layer is non-magnetic but conducting material.

With respect to any of these devices, the self-seeded <111> crystal texture pinned reference layer **308** advantageously simplifies the fabrication tasks and provides devices of greater reliability. In addition, the ability to permit top pinned TMR devices is advantageous in that the data layer **304** may be formed directly upon a seed layer (such as a bottom

conductor) such that the resulting structure is smoother than is otherwise typically achieved with bottom-pinned devices, including of course TMR devices.

On the other hand, Shimazawa is quite different. From FIG. 1 it is very clear that the structure set forth is using a non-magnetic metal layer **11** followed by the combination of ferromagnetic layer **12a** and pinned layer **12b**. It is also clear that a ferromagnetic layer **10** is joined to the non-magnetic metal layer **11**, opposite from the combined **12a/12b** layer. This is the structure of a giant magneto-resistance memory cell (GRM). The intermediate layer is not a dielectric, but rather is specifically identified to be a non-magnetic metal layer **11**. As the data layer (the ferromagnetic free layer **10**) is joined to the metal layer **11**, which is in turn joined to the **12a/12b** layer, the structure is substantially metal and no intervening dielectric layers are permitted. The reliance upon pure metal to metal as taught in Shimazawa is most probably due to the desire to propagate good crystal structure throughout and the realization that establishing good $\langle 111 \rangle$ crystal texture is difficult when incorporating non-metal layers.

Shimazawa does disclose that layer **11** may be Cu which not surprising given that Cu can be used to provide $\langle 111 \rangle$ texture. So can Ta. However, other metals that might be applicable in a GMR device are not applicable to the Shimazawa device because they will not provide the $\langle 111 \rangle$ crystal texture seeding.

Applicant's self-seeded $\langle 111 \rangle$ crystal texture pinned reference layer **308** is applicable in TMR and GMR devices and does not impose limitations upon the metal material that may be used for the intermediate non-magnetic metal layer **11**.

Lambeth is quite detailed, but not quite the right reference for exchange bias. It does describe how to achieve good $\langle 111 \rangle$ crystal texture, but it does so by utilizing underlying layers, which in effect seed the desired development of the $\langle 111 \rangle$ crystal structure. Although the use of underlying layers may be an effective method to provide good $\langle 111 \rangle$ texture, these underlying layers would likely degrade the performance of the cell. Such degradation may originate on many fronts – the additional complexity in fabrication to provide the underlying layers, the increased separation of the data layer **304** and the self-seeded $\langle 111 \rangle$ crystal texture pinned reference layer **308** by including the intermediate layer **304** and underlying layers to seed the reference layer, the affect on the spin polarization and hence the MR signal provided by the device, the potential need for greater magnetic fields in light of the increased distance, and potentially greater currents to achieve the necessary spin characteristics through the devices.

Indeed, simply stated while it is well and good that Lambeth teaches a method to provide good $\langle 111 \rangle$ structure, it does so in such a way that would thwart or diminish the functionality of the device.

Now turning to the rejection under 35 U.S.C. §103(a), it is respectfully noted that, to substantiate a *prima facie* case of obviousness, the initial burden rests with the Examiner who must fulfill three requirements. More specifically:

To establish a *prima facie* case of obviousness, three basic criteria must be met.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings.

Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The ***teaching or suggestion*** to make the claimed combination **and the *reasonable expectation of success*** **must both be found in the prior art, and not based on applicant's disclosure.** (emphasis and formatting added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

As noted above Shimazawa teaches a GMR device. As GMR devices require the intermediate layer to be a non-magnetic metallic layer, Shimazawa can not be viewed as extending to the TMR devices that may enjoy applicant's self-seeded <111> crystal texture pinned reference layer **308**. Further even with GMR devices, Shimazawa must require a seeding layer, which may be the non-magnetic metallic layer, but a seeding layer is required to establish the <111> crystal texture for the pinned reference layer.

Lambeth, although providing a method to establish <111> crystal structure does so in a way that is not compatible with the fabrication of reference layers for memory devices or read devices. For example, in the case where the embodiment is a top-pinned spin valve structure for a TMR device, the intermediate layer must be an insulating oxide and it is very critical that the ferromagnetic layer adjacent to it be exactly what it is designated to be – the component that dictates the spin-polarization and hence the MR signal that will be produced by the device. To combine Lambeth and Shimazawa would entail adding layers below 12a/12b layers arbitrarily just to get good texture – and that would thwart the intended functionality of the cell.

Neither Shimazawa nor Lambeth can be pointed to for some suggestion or motivation to combine so as to provide applicant's self-seeded <111> crystal texture pinned reference layer **308** or devices incorporating such a self-seeded <111> crystal texture pinned reference layer **308**.

This absence is noted by Examiner with respect to Shimazawa; however Examiner's assertion that it would have been obvious to modify Shimazawa in view of Lambeth is in error. As the teachings of Lambeth would frustrate the intended operation of the spin-valve device, it can not be said that such a combination would be obvious at all – rather it would be obvious not to make such a combination.

Paralleling the MPEP references cited above, the Federal Circuit has enunciated that a *prima facie* case of obviousness is established **when and only when the teachings from the prior art itself** would appear to have **suggested** the claimed subject matter to a person of ordinary skill in the art. *In re Bell*, 991 F.2d 781, 783, 26 U.S.P.Q.2d 1529, 1531 (Fed Cir. 1993) (quoting *In re Rinehart*, 531 F.2d 1048, 1051 (C.C.P.A. 1976)). (Emphasis added). "The mere fact that the prior art **may** be modified in the manner suggested by the Examiner does **not** make the modification obvious unless the prior art suggested the desirability of the modification." (emphasis added) *In re Fritch*, 23 USPQ 2d 1780, 1783-84 (Fed. Cir. 1992).

There is no clear or implied indication in either reference that such a modification would be desirable. Rather, as the combined references suggest a device with degraded performance, if operability at all – the element of expected success is also absent.

Indeed, the device as taught by applicant is clearly much more general and versatile in its applicability than any device which might be achieved through the combination of Shimazawa and Lambeth.

So as to further clarify the aspect of the self seeding nature of the combined layer, independent claims 3, 14, 21, 31, and 34 have been amended to recite the self seeding property occurring independent of an underlying substrate. This aspect is clearly absent in the Shimazawa and Lambeth references whether viewed separately or collectively.

Moreover, as demonstrated herein above, Shimazawa and Lambeth fail to teach or suggest each and every limitation of applicant's claims, particularly the self seeding property that is free of any substrate. For at least this reason, applicant contends that claim 1 is allowable over Rizzo, and requests withdrawal of the Examiner's rejection.

Applicant has added new claims 40 through 45 which relate to spin-valve structures incorporating a self-seeded <111> crystal texture pinned reference layer **308** as taught by applicant. Specifically, in matched sets these claims set forth embodiments wherein the intermediate layer is a dielectric – and wherein the intermediate layer is a non-magnetic metallic layer unsuitable to seed for <111> crystal texture. As claims 40, 41 depend from independent claim 21, claims 42, 43 depend from claim 31, and claims 44, 45 depend from claim 34, these novel embodiments only further differentiate applicant's teachings from those of Shimazawa and Lambeth.

CONCLUSION

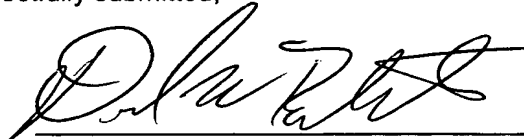
In view of the above Remarks and the amendment to the Claims, applicant has addressed all issues raised in the Office Action dated 27 July 2006, and respectfully solicits a Notice of Allowance for claims 3-10, 14-18, 21-25, and 27-45. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicant believes that no fees are due; however, should any fee be deemed necessary in connection with this Amendment and Response, the Commissioner is authorized to charge deposit account 08-2025, referencing the Attorney Docket Number 100202557-1.

Respectfully submitted,

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